

**WHAT IS CLAIMED IS:**

1. A multichannel printhead for forming an image onto a photosensitive medium by exposing pixels in a succession of exposures, the printhead comprising:
  - (a) an illumination array of light emitting diode (LED) light sources fitted into a housing at a first position;
  - (b) a lens array comprising a plurality of lenses fitted into said housing at a second position;
  - (c) a light-guiding array of uniformizer elements, arranged within a corresponding array of cavities formed within said housing and extended between said first position and said second position; andwherein, for each pixel exposed on the photosensitive medium:
  - a single said LED light source in said illumination array provides light into a single corresponding said uniformizer element in said light-guiding array which directs light to a corresponding said lens of said lens array.
2. A multichannel printhead according to claim 1 wherein said housing is formed from a silicon substrate.
3. A multichannel printhead according to claim 1 wherein said housing is formed from a base section and a cover section.
4. A multichannel printhead according to claim 1 wherein said uniformizer elements comprise a reflective surface.
5. A multichannel printhead according to claim 1 wherein at least one uniformizer element comprises an optical fiber.

6. A multichannel printhead according to claim 1 wherein said array of cavities is formed by aligning a first set of grooves in said base section with a corresponding second set of grooves in said cover section.

7. A multichannel printhead according to claim 1 wherein at least one said lens in said lens array is a compound lens.

8. A multichannel printhead according to claim 7 wherein said compound lens comprises a plurality of aspheric surfaces.

9. A multichannel printhead according to claim 8 wherein the sag of any of said plurality of aspheric surfaces is less than about 40 microns.

10. A multichannel printhead according to claim 7 wherein said compound lens comprises a material having a refractive index greater than 2.0.

11. A multichannel printhead according to claim 1 wherein said lens array provides non-unity magnification of said illumination array of LED light sources.

12. A multichannel printhead according to claim 1 wherein said illumination array is fabricated on a single substrate.

13. A multichannel printhead according to claim 1 wherein said LED light sources each emit substantially the same wavelength.

14. A multichannel printhead according to claim 1 wherein different said LED light sources in said illumination array emit different wavelengths.

15. A multichannel printhead according to claim 1 wherein said cavities are substantially parallel.

16. A printing apparatus for forming an image onto a photosensitive medium, comprising:

(a) a multichannel printhead for forming an image onto a photosensitive medium by exposing pixels in a succession of exposures, the printhead comprising:

- (i) an illumination array of LED light sources fitted into a housing at a first position;
- (ii) a lens array comprising a plurality of lenses fitted into said housing at a second position; and
- (iii) a light-guiding array of uniformizer elements, arranged within a corresponding array of cavities formed within said housing and extended between said first position and said second position;

wherein, for each pixel exposed on the photosensitive medium:

a single said LED light source in said illumination array provides light into a single corresponding said uniformizer element in said light-guiding array which directs light to a corresponding said lens of said lens array;

(b) a media transport for providing spatial translation of the photosensitive medium relative to said printhead; and

(c) a printhead transport for scanning said printhead across a surface of the photosensitive medium, forming an exposed image thereby.

17. A printing apparatus according to claim 16 wherein said media transport comprises a rotating drum.

18. A printing apparatus according to claim 16 wherein said printhead transport comprises a drive belt.

19. A printing apparatus according to claim 16 wherein said printhead transport comprises a lead screw.

20. A printing apparatus according to claim 16 wherein said media transport comprises a drive roller.

21. A printing apparatus according to claim 16 wherein said housing is formed from a silicon substrate.

22. A printing apparatus according to claim 16 wherein said housing comprises a base section and a cover section.

23. A printing apparatus according to claim 16 wherein said uniformizer elements comprise a reflective surface.

24. A printing apparatus according to claim 16 wherein at least one uniformizer element comprises an optical fiber.

25. A printing apparatus according to claim 16 wherein said cavities are formed by aligning a first set of grooves in said base section with a second set of grooves in said cover section.

26. A printing apparatus according to claim 16 wherein at least one said lens in said lens array is a compound lens.

27. A printing apparatus according to claim 26 wherein said compound lens comprises a plurality of aspheric surfaces.

28. A printing apparatus according to claim 27 wherein the sag of any of said plurality of aspheric surfaces is less than about 40 microns.

29. A printing apparatus according to claim 27 wherein said compound lens comprises a material having a refractive index greater than 2.0.

30. A printing apparatus according to claim 16 wherein said lens array provides non-unity magnification of said illumination array of LED light sources.

31. A printing apparatus according to claim 16 wherein said illumination array is fabricated on a single substrate.

32. A printing apparatus according to claim 16 wherein said LED light sources each emit substantially the same wavelength.

33. A printing apparatus according to claim 16 wherein different said LED light sources in said illumination array emit different wavelengths.

34. A printing apparatus according to claim 16 wherein said cavities are substantially parallel.

35. A multichannel printhead for forming an image onto a photosensitive medium by exposing pixels in a succession of exposures, wherein each channel of the multichannel printhead comprises:

- (a) a light source fitted within a housing at a first position;
- (b) a lens fitted into said housing at a second position for directing exposure light onto the photosensitive medium;
- (c) a uniformizer element comprising a reflective cavity formed within said housing and extended between said first position and said second position; and

wherein, for exposing each pixel, said light source provides said exposure light to said uniformizer element, which guides said exposure light to said lens.

36. A multichannel printhead according to claim 36 wherein said light source is an LED.

37. A method for forming an image onto a photosensitive medium by exposing pixels in a succession of exposures, the method comprising:

(a) fitting an illumination array of LED light sources into a housing at a first position;

(b) seating a lens array against said housing at a second position;

(c) extending a light-guiding array of uniformizer elements, arranged within a corresponding array of cavities formed within said housing, between said first position and said second position; and

wherein, for each pixel exposed on the photosensitive medium:

a single said LED light source in said illumination array provides light into a single corresponding said uniformizer element in said light-guiding array which directs light to a single corresponding said lens of said lens array.

38. A method for forming an image according to claim 37 wherein the step of extending a light-guiding array of uniformizer elements comprises the step of providing at least one optical fiber.

39. A method for forming an image according to claim 37 wherein the step of extending a light-guiding array of uniformizer elements comprises:

(a) forming a series of grooves in said housing; and

(b) providing a reflective surface within at least one surface of at least one of said parallel grooves.

40. A method of manufacture of a printhead for forming an image onto a photosensitive medium by exposing pixels in a succession of exposures, the method comprising:

(a) forming an illumination array of LED light sources on a single substrate;

(b) forming a lens array comprising a plurality of lenses;

(c) forming a light guiding array of uniformizer elements, arranged within a corresponding array of cavities formed within a housing;

(d) forming a slot within said housing, said slot perpendicular to said light guiding array and at one end of said light guiding array, and aligning, in said slot, said illumination array with said light guiding array, whereby each said LED light source is aligned with one of said cavities; and

(e) forming a seat at the output side of said housing, said seat parallel to said slot and at the opposite end of said light guiding array from said slot, and aligning said lens array in said seat, whereby each lens in said plurality of lenses is aligned with one of said cavities.

41. A method of manufacture according to claim 40 wherein the step of forming a light guiding array further comprises the step of forming a first array of grooves in a base and a second array of matching grooves in a cover and coupling said cover to said base, forming said cavities thereby.

42. A method of manufacture according to claim 40 wherein the step of forming a lens array comprises the step of aligning a first lenslet array with a second lenslet array.

43. A method of manufacture according to claim 40 wherein the step of forming a light guiding array comprises the step of applying a reflective coating.

44. A method of manufacture according to claim 40 wherein the step of forming a lens array comprises the step of using gray scale etching.

45. A multichannel printhead for forming an image onto a photosensitive medium the printhead comprising:

- (a) an illumination array of light sources fitted into a housing at a first position;
  - (b) a lens array comprising a plurality of lenses fitted into said housing at a second position;
  - (c) an array of uniformizer elements, arranged within a corresponding array of cavities formed within said housing and extended between said first position and said second position; and
- wherein, for each pixel exposed on the photosensitive medium:

a single said light source in said illumination array provides light into a single corresponding said uniformizer element in said array of uniformizing elements which directs light to a corresponding said lens of said lens array.

46. A multichannel printhead according to claim 45 wherein at least one of said light sources is a light emitting diode (LED).

47. A multichannel printhead according to claim 45 wherein at least one of said light sources is an organic light emitting diode (OLED).

48. A multichannel printhead according to claim 45 wherein said uniformizer elements comprise a reflective surface in said array of cavities.

49. A multichannel printhead according to claim 45 wherein at least one uniformizer element comprises an optical fiber.



50. A multichannel printhead for forming an image onto a photosensitive medium by exposing pixels in a succession of exposures, the printhead comprising:

(a) an illumination array of light emitting diode (LED) light sources fitted into a housing at a first position;

(b) a lens array comprising a plurality of lenses fitted into said housing at a second position;

(c) a light-guiding array of uniformizer elements, arranged within a corresponding array of cavities formed within said housing and extending between said first position and said second position;

wherein, for each pixel exposed on the photosensitive medium:

a single said LED light source in said illumination array provides light to a single corresponding uniformizer element in said light-guiding array which directs light to a corresponding lens of said lens array;

wherein said housing is formed from a base section and a cover section;

wherein said uniformizer elements comprise a reflective surface on interval surfaces of at least one of said cavities; and

wherein at least one of said lens in said lens array is a compound lens.